BELLCOMM, INC.
1100 Seventeenth Street, N.W. Washington, D.C. 20036

SUBJECT: Trip Report - Boeing, Huntsville, Alabama, September 1, 1967 Case 103-2

DATE: October 11, 1967

FROM: C. Bendersky

ABSTRACT

The highlights of a discussion of the capabilities of a family of intermediate capacity launch vehicles based on use of the Boeing S-IC stage are presented. The meeting was held at the Boeing Company, Huntsville, Alabama on September 1, 1967.

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MEMORANDUM FOR FILE

On September 1, 1967, we (J. M. Tschirgi, J. Schelke, C. L. Davis and the writer) visited the Boeing Company, Huntsville, Alabama to discuss the potential of the intermediate class of launch vehicles based on the Saturn V S-IC stage and efficient usage of Complex 39, KSC. The meetings were arranged by and at the request of Col. J. R. Burke, NASA/MTV and were designed to:

1. Review the cost and performance data being presented throughout NASA Headquarters,* and
2. Provide data for comparison with the Minute Man/Uprated Saturn I as proposed for AAP.

The family of vehicles include the following:

1. Standard Saturn V: The Boeing S-IC first stage, NAA S-II second stage, and Douglas S-IVB third stage;
2. MLV INT-21: The S-IC and S-II stages. This combination (plus a new IU) is commonly referred to as the "two stage Saturn V;"
3. MLV INT-20: S-IC and S-IVB stages; and
4. Single Stage-to-Orbit, "S-ID:" An S-IC modified to drop the four outboard F-1 engines and associated structure during ascent. The stage would operate in a mode similar to the Atlas 1-1/2 stage operation. The staged structure weighs approximately 50 percent of the total. If developed the SI-D would be incorporated into all the preceeding configurations.

Boeing claims that the S-IC family of intermediate vehicles are an economic approach which can provide the necessary flexibility to satisfy NASA's needs from Uprated Saturn I** to full

*These presentations are being or have been given to OSSA, OART, MSR (ML) as well as KSC and MSFC.

**A 2 engine S-IC/S-IVB or SI-D vehicle could boost S-IB type payloads (up to 60,000 lbs.) to low earth orbit.

Saturn V payload capabilities. The major advantage would occur under conditions of maximum utilization of Complex 39. Under ground rules of limited Saturn V utilization, Boeing approaches are available which are cheaper than any known alternate (i.e., S-IB or Titan derivatives).

The presentation concentrated on the design and costing results of both NASA/MTV uprated Saturn V studies (INT-20 and INT-21) and the latest Boeing in-house studies (KSC impact and SI-D concept).

No absolute conclusions were possible as result of the meeting, however:

1. It does appear that the INT-20 vehicle could be developed at a cost comparable to the Minute Man/S-IB as proposed for AAP without the low payload limitation. The AAP Minute Man strap-on (4 motors) S-IB configuration has a low earth orbit payload of 46,000-to-49,000 lbs. and costs are estimated at between 3 and 13 million dollars less than the MLV INT-20. (This assumes a successful Saturn V flight test program and the same number of flight tests for man-rating.)

2. Adoption of the INT-20 configuration would allow early cancellation of the Uprated S-1 program without loss of mission mode options, yet remain within reasonable restraints of funding or timing.

3. It is clear that if intermediate capability becomes a requirement and launched payload rates are within the scheduling limitations of Complex 39, the INT-20 is the way to go.

4. It also seems clear that there are sound long term economic advantages of the concept if total launch rates in these payload categories remain eight or less per year.

Figure 1 presents a Boeing cost and payload comparison of several competing vehicles as used in the presentation.

A comment on the costing of the Saturn V is warranted. Present levels of projected overhead charges approach 80 percent

of the total. These overhead charges are those incurred between vehicle purchase and lift-off at KSC. The area should be fertile ground for real economies.

A list of attendees are appended.

C. Bendersky

1013-CB-pdm

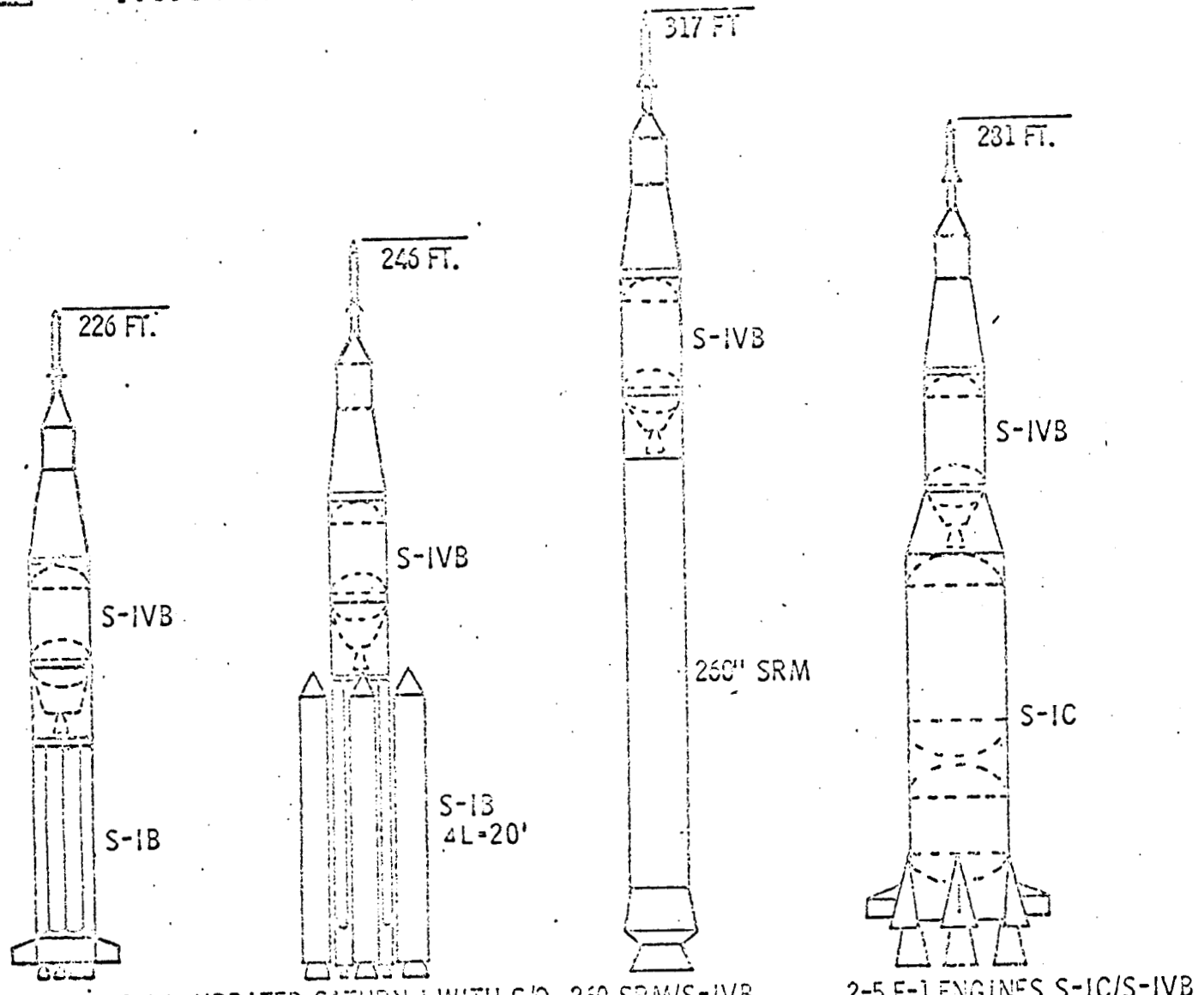
Attachment
List of Attendees
Figure 1

LIST OF ATTENDEES

NAME	ORGANIZATION
R. J. Davies	NASA R-AS-VG
W. D. Robinson	Boeing Tech Staff
C. Bendersky	Bellcomm
M. A. Page	NASA - MSFC R-AS-VG
C. L. Davis	Bellcomm
J. A. Schelke	Bellcomm
J. M. Tschirgi	Bellcomm
R. H. Hansen	Boeing/Michoud
J. E. Martin	Boeing
L. Lane	Boeing

FIGURE 1

INTERMEDIATE PAYLOAD VEHICLES



UPRATED SATURN I | UPRATED SATURN I WITH S/O 0, 2, 4-120 SRM'S | 260 SRM/S-IVB | 2-5 F-1 ENGINES S-IC/S-IVB

PAYLOAD, 100NM ORBIT 40K | 38 82.2 108.5 K | 95K | 36-150 K

INVESTMENT COST NONE | $193M | $385M | $73M

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